Surviving Lambs with Myelomeningocele Repaired in utero with Placental Mesenchymal Stromal Cells for 6 Months: A Pilot Study.

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Public Summary:
BACKGROUND: Fetal repair of spina bifida with placenta derived stem cells rescues ambulation in a sheep model up to 48 h after birth. Outcomes past 48 h are unknown as spina bifida lambs have not been survived past this timepoint. OBJECTIVE: We aimed to survive lambs for 6 months following the fetal repair of spina bifida with placenta stem cells. METHODS: Fetal spina bifida lambs were repaired in-utero with placenta stem cells. Lambs received either no additional treatment or after birth bracing and physical therapy (B/PT). The ability to walk was assessed with the sheep locomotor rating scale (SLR). Lambs with an SLR of 15 at birth were survived for 6 months or until a decline in SLR less than 15, whichever came first. All lambs underwent an MRI prior to being euthanized. RESULTS: The lambs with no bracing and physical therapy (n = 2) had SLR declines to 7 and 13 at 29 and 65 days, respectively, and were euthanized. These lambs had a spinal angulation of 57 degrees and 47 degrees , respectively. The B/PT lamb (n = 1) survived for 6 months with a maintained a SLR of 15 and a lumbar angulation of 42 degrees . CONCLUSION: Post birth physical therapy and bracing allowed spina bifida lambs that were treated with placenta stem cells to be survived up to 6 months.

Scientific Abstract:
BACKGROUND: Fetal repair of myelomeningocele (MMC) with placental mesenchymal stromal cells (PMSCs) rescues ambulation in the ovine model up to 48 h postnatally. Outcomes past 48 h are unknown as MMC lambs have not been survived past this timepoint. OBJECTIVE: We aimed to survive lambs for 6 months following the fetal repair of MMC with PMSCs. METHODS: Fetal MMC lambs were repaired with PMSCs. Lambs received either no additional treatment or postnatal bracing and physical therapy (B/PT). Motor function was assessed with the sheep locomotor rating (SLR). Lambs with an SLR of 15 at birth were survived for 6 months or until a decline in SLR less than 15, whichever came first. All lambs underwent a perimortem MRI. RESULTS: The lambs with no postnatal treatment (n = 2) had SLR declines to 7 and 13 at 29 and 65 days, respectively, and were euthanized. These lambs had a spinal angulation of 57 degrees and 47 degrees , respectively. The B/PT lamb (n = 1) survived for 6 months with a sustained SLR of 15 and a lumbar angulation of 42 degrees . CONCLUSION: Postnatal physical therapy and bracing counteracted the inherent morbidity of the absent paraspinal muscles in the ovine MMC model allowing for survival and maintenance of rescued motor function of the prenatally treated lamb up to 6 months.